

## Washing Apparatus and Method of Washing Laundry

### Field of the Invention

The present invention relates to a washing apparatus to wash the laundry stored in a washing tank, and a method of washing the laundry.

### Background of the Invention

A conventional washing apparatus has a configuration as shown in Fig. 41. The configuration of such conventional washing apparatus will be described in the following.

As shown in Fig. 41, a washing tank 71 stores clothes 72 therein. The water or wash water is supplied from a feed water passage 73. A stirring blade 74 disposed at the inside bottom of the washing tank 71 is driven by a rotary drive unit 75 disposed under the washing tank 71 via a speed reducer 76. In this way, the clothes 72 stored in the washing tank 71 are washed. A drain hose 77 is led out of the washing tank 71, and after the end of a washing process, the drain hose is shifted down to discharge the water out of the washing tank 71. Thus, a conventional washing apparatus includes the washing tank 71, rotary drive unit 75, and drain hose 77 altogether.

In such prior art configuration, it is necessary to carry the entire drive unit to a place where a water supply means is available or to a place where a draining means is available for the washing purpose. Also, when transferring the clothes into an ordinary washing machine after washing,

it is necessary to put the clothes into an another container such as a bucket.

Also, recent household washing machines are shifting from two-tank washing machines to fully automatic washing machines. In addition, popular type washing machines have come to be provided with various functions. However, such washing machine is rather all-round, in which clothes such as underwear and towels that should be sanitary are washed together with soiled mops or socks. Accordingly, there has been a growing demand for a washing machine by which only the extremely soiled laundry can be easily washed prior to regular washing from the viewpoint of sanitation.

Due to a recent trend of people's having love of cleanliness, the clothes are not so much soiled or stained as they used to, and as a whole, the laundry is rather free of extreme dirt or soil. However, there still exist extremely soiled clothes such as children's socks and there remains a strong demand for completely washing such clothes. A large sized washing machine is able to achieve the purpose but it consumes a great deal of water and detergents, and also, the frequency of washing will be increased. Accordingly, there is a demand for a washing apparatus which is capable of simply washing only extremely soiled laundry and also can be easily operated.

Further, because of the bad housing situation in these days, even in case of a small sized washing machine of former type, the space required for installing the washing apparatus is very significant. Therefore, there is a demand for a washing apparatus which is compact and functional.

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In addition, since clothes are diversified nowadays, in the case of women's underwear in particular, such diversified and delicate clothes are increasing, which are subjected to deformation or color fading when washed together, for example, in a fully automatic washing machine. As a result, despite the evolution of washing machines, there are always utensils such as buckets and washtubs which are simple washing means at homes. And the clothes are often washed by hands. Besides the purpose of washing delicate clothes, buckets or the like are also used for bleaching or starching dress shirt, washing pet clothes, cars, etc. Accordingly, the user's hands often get rough with washing.

The present invention is intended to provide a washing apparatus which is easy to handle and improved in before- and after-washing operation ability, and a method of washing the laundry.

### Summary of the Invention

A washing apparatus of the present invention comprises:

- (a) a driving side base having a rotary drive unit; and
- (b) a washing tank having a stirring blade;

wherein a rotational drive of the rotary drive unit can be transmitted to the stirring blade when the washing tank is mounted on top of the driving side base.

Preferably, a washing apparatus of the present invention comprises:

- (1) a driving side base having a rotary drive unit and a second

transfer joint; and

(2) a washing tank for storing the laundry,

wherein the second transfer joint is connected to the rotary drive unit and is able to rotate.

The washing tank comprises:

an opening formed at the upper portion of the washing tank;

a rotatable shaft piercing through the bottom portion of the washing tank;

a rotatable stirring blade disposed on the shaft inside the washing tank; and

a first transfer joint which is disposed on the shaft, outside the bottom of the washing tank, and serves to transmit a rotational drive to the stirring blade.

The washing tank can be mounted on top of the driving side base and can also be separated from top of the driving side base.

When the washing tank is mounted on top of the driving side base, the first transfer joint and the second transfer joint come to engage each other. With the washing tank mounted on top of the driving side base, the stirring blade rotates when the rotary drive unit is operated.

Preferably, the stirring blade is disposed at the upper end of the shaft, and the second transfer joint is connected to the lower end of the shaft.

A method of washing the laundry of the present invention

comprises the steps of:

- (a) preparing a driving side base having a rotary drive unit;
- (b) preparing a washing tank having a stirring blade;
- (c) mounting the washing tank on top of the driving side base,

where the stirring blade and the rotary drive unit are connected with each other when the washing tank is mounted on top of the driving side base;

- (d) putting a laundry into the washing tank

- (e) putting a water into the washing tank;

(f) driving the rotary drive unit, at a state that the washing tank containing the laundry and the water is mounted on the driving side base,

thereby the stirring blade is driven to stir the water and the laundry; and

(g) separating the washing tank being mounted on top of the driving side base from the driving side base.

By this configuration, it is possible to obtain a washing machine which is easier to handle and improved in before- and after-washing operation ability.

### Brief Description of the Drawings

Fig. 1 is an exploded sectional view of a washing apparatus in the first embodiment of the present invention.

Fig. 2 is an exploded perspective view partially broken away of the washing apparatus of Fig. 1.

Fig. 3 is a sectional view of the washing apparatus of Fig. 1.

Fig. 4 is a sectional view of a washing apparatus in the second embodiment of the present invention.

Fig. 5 is a sectional view of a washing apparatus in the third embodiment of the present invention.

Fig. 6 is an exploded perspective view partially broken away of a washing apparatus in the fourth embodiment of the present invention.

Fig. 7 is (a) an exploded perspective view partially broken away of the fifth embodiment of the present invention, and (b) a sectional view of an essential part of a washing tank of the washing apparatus.

Fig. 8 is a perspective view partially broken away of a washing tank of a washing apparatus in the sixth embodiment of the present invention.

Fig. 9 is an exploded perspective view partially broken away of a washing apparatus in the seventh embodiment of the present invention.

Fig. 10 is (a) an exploded perspective view of an essential part of a washing apparatus in the eighth embodiment of the present invention, and (b) a perspective view of an essential part of the washing apparatus.

Fig. 11 is (a) a perspective view of a cover portion of a washing apparatus in the ninth embodiment of the present invention, and (b) a perspective view in a state of draining of the washing apparatus.

Fig. 12 is (a) a perspective view of a cover portion of a washing apparatus in the tenth embodiment of the present invention, and (b) an enlarged sectional view of the cover portion of the washing apparatus.

Fig. 13 is a sectional view in a state of draining of a washing apparatus in the eleventh embodiment of the present invention.

Fig. 14 is an exploded perspective view of a washing apparatus in the twelfth embodiment of the present invention.

Fig. 15 is a perspective view in a state of draining of the washing apparatus.

Fig. 16 is (a) a perspective view of an essential part of a washing apparatus in the thirteenth embodiment of the present invention, and (b) a perspective view of an essential part in a state of draining of the washing apparatus.

Fig. 17 is (a) an exploded perspective view partially broken away of a washing apparatus in the fourteenth embodiment of the present invention, and (b) a perspective view of a cover portion of another example of the washing apparatus.

Fig. 18 is an exploded perspective view of a washing apparatus in the fifteenth embodiment of the present invention.

Fig. 19 is a perspective view in a state of overflow rinsing of the washing apparatus.

Fig. 20 is (a) a perspective view of an essential part in a state of overflow rinsing of a washing apparatus in the sixteenth embodiment of the present invention, and (b) a perspective view of an essential part of the washing apparatus.

Fig. 21 is an exploded sectional view of a washing apparatus in the seventeenth embodiment of the present invention.

Fig. 22 is an exploded sectional view of a washing apparatus in the eighteenth embodiment of the present invention.

Fig. 23 is an exploded perspective view of an essential part of the

washing apparatus.

Fig. 24 is an exploded sectional view partially broken away of a washing apparatus in the nineteenth embodiment of the present invention.

Fig. 25 is an exploded sectional view of a washing apparatus in the twentieth embodiment of the present invention.

Fig. 26 is a perspective view of a driving side base of the washing apparatus.

Fig. 27 is a perspective view of a driving side base of a washing apparatus in the twenty first embodiment of the present invention.

Fig. 28 is an exploded sectional view partially broken away of a washing apparatus in the twenty second embodiment of the present invention.

Fig. 29 is a sectional view partially broken away in a state of draining of the washing apparatus.

Fig. 30 is a sectional view partially broken away of an washing apparatus in the twenty third embodiment of the present invention.

Fig. 31 is a sectional view partially broken away of an washing apparatus in the twenty fourth embodiment of the present invention.

Fig. 32 is a sectional view partially broken away of an washing apparatus in the twenty fifth embodiment of the present invention.

Fig. 33 is (a) an exploded perspective view partially broken away of a washing apparatus in the twenty sixth embodiment of the present invention, and (b) an exploded perspective view in a state of being loaded of the washing apparatus.



Fig. 34 is a perspective view partially broken away of a washing apparatus in the twenty seventh embodiment of the present invention.

Fig. 35 is an exploded perspective view partially broken way of a washing apparatus in the twenty eight embodiment of the present invention.

Fig. 36 is an exploded sectional view of a washing apparatus in the thirtieth embodiment of the present invention.

Fig. 37 is an exploded perspective view partially broken away of a washing apparatus in the thirty first embodiment of the present invention.

Fig. 38 is an exploded perspective view partially broken away of another example of the washing apparatus.

Fig. 39 is an exploded perspective view partially broken away of a washing apparatus in the thirty second embodiment of the present invention.

Fig. 40 is a process diagram showing a method of washing the laundry of the present invention.

Fig. 41 is a sectional view of a conventional washing apparatus.

#### Description of the Reference Numerals

- |   |                      |
|---|----------------------|
| 1 | Washing tank         |
| 2 | Stirring blade       |
| 5 | Shaft                |
| 6 | First transfer joint |
| 7 | Driving side base    |
| 8 | Rotary drive unit    |

### Detailed Description of the Invention

A washing apparatus of the present invention comprises:

- (a) a driving side base having a rotary drive unit; and
- (b) a washing tank having a stirring blade;

wherein a rotational drive of the rotary drive unit can be transmitted to the stirring blade when the washing tank is mounted on top of the driving side base.

A washing apparatus in one embodiment of the present invention comprises a driving side base and a washing tank. The driving side base and the washing tank can be separated from each other, and also can be attached to each other. The driving side base has a rotary drive unit. An opening is formed at the upper portion of the washing tank. The washing tank has a stirring blade, a shaft, and a first transfer joint. The stirring blade is rotatably disposed in the washing tank and serves to stir the laundry such as clothes. The shaft is disposed piercing through the bottom of the washing tank. The shaft is fitted to the stirring blade. The first transfer joint for transferring a rotational drive to the stirring blade is disposed on the shaft at a position outside the washing tank. The driving side base has a second transfer joint disposed on top of the driving side base. The second transfer joint is disposed and rotated on the rotary drive unit. When the washing tank is disposed on top of the driving side base, the first transfer joint and the second transfer joint come to engage each other.

That is, the washing tank and the driving side body can be separated from each other and also can be attached to each other. Accordingly, the washing apparatus is easy to handle and improved in before- and after-washing operation ability.

A washing apparatus in one embodiment of the present invention comprises:

(1) a driving side base having a rotary drive unit and a second transfer joint, the second transfer joint being connected to the rotary drive unit and rotatable; and

(2) a washing tank for storing the laundry,

where the washing tank comprises:

an opening formed at the upper portion of the washing tank;

a rotatable shaft piercing through the bottom of the washing tank;

a rotatable stirring blade disposed on the shaft inside the washing tank; and

a first transfer joint disposed on the shaft, outside the bottom of the washing tank, and serves to transfer a rotational drive to the stirring blade,

wherein the washing tank can be mounted on top of the driving side base and can also be separated from top of the driving side base;

when the washing tank is mounted on top of the driving side base, the first transfer joint and the second transfer joint come to engage each other; and

with the washing tank mounted on top of the driving side base, the

stirring blade rotates when the rotary drive unit is operated.

Thus, when the laundry is put into the washing tank and water (water, water and detergent, water and bleacher, water and softener or water and starch, etc.) is applied therein, and after the end of washing, it is possible to carry only the washing tank, separating it from the driving side base. When the washing tank containing the laundry and wash water is placed on the driving side base, the first transfer joint and the second transfer joint are automatically connected to each other. The rotation of the rotary drive unit is transmitted to the stirring blade. The stirring blade serves to stir the laundry and the water in the washing tank to enhance the washing effects. As a result, the washing apparatus will be improved in before- and after-washing operation ability.

A method of washing the laundry in one embodiment of the present invention comprises the steps of:

- (a) preparing a driving side base having a rotary drive unit;
- (b) preparing a washing tank having a stirring blade;
- (c) mounting the washing tank on top of the driving side base,

where the stirring blade and the rotary drive unit are connected with each other when the washing tank is mounted on top of the driving side base;

- (d) putting the laundry into the washing tank;
- (e) putting the water into the washing tank;
- (f) driving the rotary drive unit, at a state that the washing tank containing the laundry and the water is mounted on the driving side base,

thereby the stirring blade is driven to stir the water and the laundry; and

(g) separating the washing tank being mounted on top of the driving side base from the driving side base.

Preferably, in the above method of washing the laundry, the driving side base further comprises a second transfer joint disposed on top of the driving side base;

the washing tank includes a shaft piercing through the bottom of the washing tank, and a first transfer joint disposed on the shaft, outside the bottom of the washing tank; and

in the step (c), when the washing tank is mounted on top of the driving side base, the first transfer joint and the second transfer joint come to engage each other, and the stirring blade and the rotary drive unit are connected with each other via the first transfer joint, the shaft and the second transfer joint.

Preferably, in the washing apparatus and the method of washing the laundry, the stirring blade is fitted to the upper end of the shaft, and the second transfer joint is connected to the lower end of the shaft. And with the washing tank mounted on the driving side base, when the rotary drive unit is operated, the rotational drive of the rotary drive unit is transferred to the stirring blade via the second transfer joint and the first transfer joint, thereby rotating the stirring blade.

By this configuration, the above mentioned effects will be further

enhanced.

Preferably, the driving side base further comprises a rotating speed reducer installed between the rotary drive unit and the second transfer joint.

Generally, when a motor is used as a rotary drive unit, the rotation of the rotary drive unit is determined by the power supply frequency and the number of poles. In case the frequency is high, problems such as spattering of the water and insufficient rotating torque will take place and it is necessary to reduce the size of the stirring blade and to flatten the shape of the stirring blade. Accordingly, there arises a problem that the shape and rotating speed of the stirring blade suited for washing cannot be obtained. In the present embodiment, on the other hand, there is provided a speed reducer on the driving side base for the purpose of appropriately reducing the rotating speed of the washing apparatus, and therefore, the washing apparatus is able to bring about the washing effects while reliably maintaining the rotating speed at an appropriate level. Also, since the driving side base is furnished with a speed reducer, it is possible to obtain the above effects without increasing the load of the washing tank or without worsening the handling convenience.

Preferably, the driving side base has a control means for controlling the rotation of the stirring blade.

As a rotation control means, for example, a time adjusting device is employed. By such time adjusting device, the stirring blade is controlled

with respect to the preset washing time such as for ON/OFF operations and predetermined time or rotating speeds. In this way, the stirring blade operation (including proportioning control of ON and OFF) suited for washing can be realized. Further, it is possible to set the washing time suited for washing. Also, since the driving side base is equipped with a control means, it is possible to obtain a washing apparatus which maintains easiness in handling of the washing tank and is provided with good using convenience.

Preferably, the washing tank further comprises a grip portion disposed close to the opening.

Due to the grip portion, the driving side base and the washing tank can be easily attached to or detached from each other. Also, the operations to make preparations for washing and to carry the laundry can be easily performed by using the grip portion.

Preferably, the washing tank has at least one water level line formed on the inner wall thereof. The water level line indicates the level of the wash water poured into the washing tank.

Since the detachable washing tank has a water level line, it is possible to easily set and adjust the water level suited for washing according to the quantity of the laundry. Further, due to the water level line provided for the washing tank, when the washing tank is mounted on the driving side base, the inclination of the washing tank can be visually checked, and thus, the washing tank can be prevented from trouble such as

falling down.

Preferably, the washing tank has at least one wash assisting convex portion disposed nearly vertically close to the bottom of the inner wall thereof.

During the washing process, the clothes are rubbed against the convex portion as the stirring blade is rotated, and thereby, the convex portion serves a function as a washboard. As a result, the washing forces can be enhanced.

Preferably, the washing tank further includes a cover disposed at the opening, and the cover can be opened and closed.

When making the preparations for washing and carrying the washing tank containing the laundry and the water, the cover of the washing tank serves to prevent trouble such as spattering of the water or intrusion of foreign matter.

Preferably, the cover has a lock mechanism to keep the cover closed.

When the washing tank containing the laundry and the wash is carried, the lock mechanism prevents the cover from removal. Also, the lock mechanism prevents the cover from being accidentally opened by a child, preventing the child from doing mischief that may cause him or her to get hurt.



Preferably, the cover has a hole for draining the wash water in the washing tank. When the washing tank is inclined or turned upside down, the wash water is discharged out of the washing tank.

By this configuration, after the end of washing, the wash water can be discharged from the hole formed in the cover by inclining the washing tank with the cover placed thereon. In that case, it is possible to prevent the laundry from getting out of the washing tank while discharging only the water by regulating the size of the hole. Thus, the laundry and the water can be easily separated. For example, it is possible to reuse the wash water or easy to discharge the water into a toilet bowl.

Preferably, the cover further includes a draining rib disposed at the exterior side of the hole.

By this configuration, when draining is started by inclining the washing tank, and at the end of draining, it is possible to prevent dripping of the wash water from the hole, thereby preventing the outer wall of the washing tank from being stained by the wash water, and also to prevent the wash water from dripping onto the floor. Accordingly, the draining work can be easily performed.

Preferably, the cover further has a projection disposed at the washing tank side of the hole, and the projection may prevent the hole from being closed with the laundry.

When the washing tank is inclined to separate the laundry from the water contained therein, the drain hole is sometimes closed with the

laundry, causing hindrance to separation of the water from the laundry. However, the above configuration may prevent generation of such trouble. That is, the projection disposed at the washing tank side of the hole will not allow the laundry to stick to the near area to close the drain hole. As a result, the wash water can be easily discharged and separated from the laundry.

Preferably, the washing tank further includes a bottom drain hose disposed nearly at the lower portion of the washing tank, and the drain hose is used to discharge the wash water out of the washing tank.

By this configuration, the wash water can be easily discharged to a drainage. As a result, the operation ability of the washing apparatus will be improved.

Preferably, the washing tank further comprises a lower cut-off valve disposed in the drain passage of the bottom drain hose, and the lower cut-off valve controls the drain.

By this configuration, even when the drain hose is shifted down by mistake during washing operation or carrying the washing tank, the wash water will not flow out of the drain hose.

Preferably, the washing tank further includes a feed water passage disposed near the upper portion of the washing tank, and the feed water passage supplies water into the washing tank.

By this configuration, in case of a water supply faucet located

higher than the washing tank, for example, when feeding the wash water into the washing tank by using a water hose, the work can be smoothly performed by inserting the hose into the feed water passage.

Preferably, the washing tank further comprises an upper drain hole disposed near the upper portion of the washing tank and an upper drain hose connected to the upper drain hole.

By this configuration, when rinsing in the washing tank, overflow rinsing can be performed while feeding water up to the specified level into the washing tank. Accordingly, the laundry can be continuously and smoothly rinsed without repeating water feeding and discharging.

Preferably, the washing tank further comprises an upper drain cut-off valve disposed in the drain passage of the upper drain hose, and the upper drain cut-off valve controls the drain.

By this configuration, even when no overflow rinsing is performed, in case of carrying the washing tank containing the water or washing with the water filled up to a high level, for example, it is possible to prevent the wash water from overflowing and to prevent the floor surfaces from being stained with the wash water.

Preferably, the driving side base has a guide disposed at the top of the driving side base, and with the washing tank mounted on top of the driving side base, the guide is connected to the lower portion of the washing tank.

By this configuration, placing the washing tank on the driving side base is just enough to smoothly connect the first transfer joint to the second transfer joint. That is, the washing tank and the driving side base can be easily attached to and detached from each other. As a result, the operation ability of the washing apparatus will be improved.

Preferably, the driving side base further includes a tank fixing support portion, and the washing tank further includes a tank fixing portion. The tank fixing support portion and the tank fixing portion serve to fix the washing tank on the driving side base.

By this configuration, the washing tank can be prevented from being brought down by the user during washing. Also, the washing tank can be prevented from being disengaged from the driving side base due to vibration or the like.

Preferably, the driving side base further comprises a connection detector and a controller. The connection detector serves to detect the connection and separation between the driving side base and the washing tank. The controller serves to control the rotation of the rotary drive unit with the output from the connection detector.

By this configuration, when the washing tank is separated from the driving side base, the controller serves to stop or slow down the rotation of the rotary drive unit with the output from the connection detector. Also, the second transfer joint of the driving side base is prevented from operating alone, and the user can be prevented from

getting hurt by touching a rotating part. In case the washing tank is not completely mounted on the driving side base, generation of a trouble such as removal of the washing tank from its position can be prevented.

Preferably, the driving side base comprises a protective projection disposed so as to cover the periphery of the second transfer joint.

By this configuration, when the washing tank is not placed on the driving side base, placing an object on the second transfer joint can be prevented. When setting the washing tank in place, bumping the washing tank against the second transfer joint can be prevented. The second transfer joint is prevented from being deformed or damaged even in case the driving side base is dropped during carrying. Also, in case of no detecting function, the user is prevented from putting the finger into a space at the side of the second transfer joint. Or, the user if tumbled is prevented from touching the hand to the second transfer joint. Thus, the user is protected from getting hurt.

Preferably, the driving side base includes a drain passage disposed at the top of the driving side base, and the drain passage serves to discharge the water staying near the second transfer joint.

By this configuration, when the washing tank is placed on or removed from the driving side base, even in case of spilling the water a little, or in case of spilling the water on the second transfer joint by mistake, the water will not stay at the second transfer joint. As a result, the water is prevented from staying inside the driving side base, thereby

preventing the driving side base from being damaged and the user from getting electric shock trouble.

Preferably, the driving side base further comprises an internal drain passage disposed in the driving side base, and the washing tank further has a drain hole provided with a drain valve. With the washing tank mounted on the driving side base, the drain valve opens, then the washing tank and the internal drain passage are connected with each other through the drain hole.

By this configuration, it is not necessary for the washing tank to have a drain port or hose, making it possible to carry out washing with the driving side base fixed in a place where drainage is available. Further, there is no fear of water leakage even when carrying the washing tank with the water contained. Also, since the driving side base has an internal drain passage, the washing tank is light-weight and its carrying load is decreased, thereby improving the washing apparatus with respect to its operation ability.

Preferably, the internal drain passage includes a drain control valve to control the drain and a drain control device to control the drain control valve.

By this configuration, after washing in the washing tank, it is not necessary to drain by inclining the washing tank, to bring down the drain hose, nor to manually open the valve. The wash water is automatically drained by the drain control device. Further, due to the configuration of

the driving side base, the washing tank is decreased in load, and also, it will be easier to carry the washing tank. As a result, the washing apparatus is improved in operation ability.

Preferably, the driving side base further includes at least either one of a water level detector to detect the wash water level in the washing tank and a draining time adjusting device to set the specified drain time. The wash water is automatically drained when at least either one of the water level detector and the draining time adjusting device is actuated.

By this configuration, after washing in the washing tank, it is not necessary to drain by inclining the washing tank, to bring down the drain hose, nor to manually open the valve. If the wash water controlled by the drain control device is too much and it is detected by the water level detector, then the wash water will be automatically drained. That is, the wash water can be automatically discharged by controlling the drain valve after lapse of the predetermined time in washing. It is possible to adjust the washing effect by opening the drain valve during washing. In this way, the quantity of the wash water can be easily and automatically decreased. Also, due to the configuration of the driving side base, the washing tank is decreased in load and can be easily carried. As a result, the washing apparatus is improved in operation ability.

Preferably, the driving side base further comprises an internal feed water passage disposed in the driving side base, a water supply means, and at least one of a detector and a water supply time adjusting device

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which are disposed in the internal feed water passage. The detector serves to detect the level of the wash water in the washing tank, and the washing tank includes a washing tank feed water passage having a feed water passage valve. Only at the state that the washing tank is mounted on the driving side base, the valve in the feed water passage opens, then the washing tank and the internal feed water passage are connected with each other via the valve in the feed water passage. The water is automatically supplied when at least either one of the water level detector and the water feed time adjusting device is actuated.

By this configuration, when the wash water level in the washing tank is too low and it is detected by the level detector, the water is automatically supplied into the washing tank. The water is automatically supplied into the washing tank for a length of the predetermine time by controlling the feed water valve in washing. It becomes possible to adjust the washing effect by opening the feed water valve during washing. Thus, the quantity of the wash water can be easily and automatically increased. Also, due to the configuration of the driving side base, the washing tank is light-weight and can be easily carried. As a result, the washing apparatus is improved in operation ability.

Preferably, the driving side base and the washing tank are structurally such that the driving side base can be stored in the washing tank.

A conventional small sized washing apparatus is convenient for the user to do washing. However, since the driving side base is one-body with



the washing tank, even when the washing tank contains no water or the laundry, the washing apparatus cannot be reduced in size, remaining unchanged in size, and therefore occupies a large space for storage. And, this is a big problem for the user because of bad housing situation today. In the case of the configuration described above, the separable driving side base can be stored into the washing tank, and therefore, the washing apparatus can be reduced in size to that of the washing tank when not in use. As a result, the washing apparatus is greatly improved in storing ability.

Preferably, the driving side base further has a storing grip portion.

By this configuration, when the driving side base is taken out of the washing tank, or the driving side base is stored into the washing tank, the work can be smoothly performed. Thus, the washing apparatus is improved in storing ability.

Preferably, the washing tank has a holding projection disposed on the inner wall of the washing tank, and the holding projection serves to hold the driving side base

By this configuration, when the driving side base is left for a long period of time in a state of being stored in the washing tank, or the washing apparatus is carried by a truck or the like, the driving side base is prevented from getting too much deep into the washing tank, and therefore, the driving side base can be easily taken out of the washing tank.

Preferably, the holding projection has a shape such that the holding projection also serves as a wash assisting convex.

By this configuration, when the stirring blade is rotated during washing, the washing effect may be improved by rubbing the clothes or laundry against the holding projection. Accordingly, strong washing forces can be obtained. Further, the configuration of the washing apparatus can be simplified.

Preferably, the driving side base further includes a battery to supply electric power to the rotary drive unit.

By this configuration, the washing apparatus can be operated even when no power supply is available in the place and can be used anywhere even in the open air.

Preferably, the driving side base can be stored under a floor or in a closet drawer or the like. For example, for washing dirty clothes such as diapers, the driving side base can be placed on a floor surface near a bathroom. In that case, after putting the baby's discharges into the toilet bowl, washing can be done in the bathroom without carrying the dirty laundry to any other place. Also, when the driving side base is kept in a section for storage, for example, when the driving side base is kept in a kitchen sink or drawer section, the laundry can be washed in the kitchen. Thus, the laundry can be easily washed on the spot only by getting the washing tank ready. As a result, the washing convenience will be enhanced.

Preferably, the driving side base further includes a device which is able to change the rotating speed and ON-OFF time of the driving side base at least in two steps.

By this configuration, for example, the rotary drive unit can be operated at a plurality of speeds, and the operation mode can be changed, properly giving indications as a strong stream of water is generated at a high speed of rotation and the rotating speed is slowed down to a middle stream and to a weak stream of water. Similarly, the rotary drive unit drives the stirring blade intermittently. The stirring blade includes a plurality of ON-time and OFF-time operations. When the ON-time is long, thick and strong clothes can be washed, and when the OFF-time is short, delicate clothes can be washed. In this way, washing can be done in various ways according to the kinds of laundry. Also, since the driving side base has such an operation variable device, the washing tank is light-weight and can be easily carried. Accordingly, the operation ability of the washing apparatus is improved.

Preferably, the washing tank is small-sized so that the user may easily carry the tank.

Preferably, the washing tank is formed from plastic mold or metallic workpiece and is light-weight. Therefore, the user may easily carry the washing tank.

A washing apparatus in an embodiment of the present invention will be described in the following with reference to the drawings.

#### Embodiment 1:

As shown in Fig. 1 and Fig. 2, washing tank 1 has an opening formed at the upper portion thereof, and stirring blade 2 to stir clothes is rotatably disposed at the bottom of the washing tank 1. The stirring blade 2 is fitted to one end of shaft 5 piercing through cut-off seal 3 and bearing 4 arranged at the bottom of the washing tank 1. The washing tank 1 is kept waterproof by the cut-off seal 3. A first transfer joint 6 for transfer of the rotational drive is attached to the other end of the shaft 5.

Driving side base 7 is furnished with a rotary drive unit 8, and the washing tank 1 can be detachably disposed on top of the driving side base 7. A second transfer joint 10 is attached to the upper end of driving shaft 9 of the rotary drive unit 8. The rotary drive unit 8 is operated with power supplied by power cord 11 that is connected to a commercial power outlet.

The washing tank 1 and the driving side base 7 can be separated from each other and also can be attached to each other. That is, the washing tank 1 can be detached from and attached to the driving side base 7.

The operation in the above configuration will be described. As shown in Fig. 3, with the washing tank 1 placed on top of the driving side base 7, the first transfer joint 6 and the second transfer joint 10 are connected with each other and unified. Thus, the washing tank 1 is mounted on the driving side base 7. When the rotary drive unit 8 is

operated, the rotation of the drive unit 8 is transmitted to the stirring blade 2 at the bottom of the washing tank 1 via the first transfer joint 6 and the second transfer joint 10, thereby rotating the stirring blade 2. Then, the stirring blade 2 agitates the laundry 13 and wash water 12 to perform washing.

Also, the washing tank 1 can be detachably disposed on top of the driving side base 7. That is, the washing tank 1 can be separated from the driving side base 7. Accordingly, when putting the laundry 13 into the washing tank 1, pouring water into the tank, and after finishing the washing, it is possible to carry only the washing tank 1, removing it from the driving side base 7. Thus, the before- and after-washing operation ability can be improved. For example, only the washing tank 1 can be carried to the desired place. The laundry in the washing tank 1 can be carried without using any separate container such as a bucket, and it is not necessary to transfer the laundry from a bucket to the washing tank 1. In addition, washing can be simply performed. For example, various kinds of laundry can be separately washed according to each kind of the laundry. It is easy to separately wash various kinds of laundry properly sorted such as unsanitary wash, slightly dirty wash, and very dirty wash. Further, the laundry that is liable to deform or change in color can be separately washed. Also, a small volume of laundry can be washed by using this washing apparatus, and therefore, the user's hands are prevented from getting rough with washing. Further, when storing the washing apparatus, it is possible to separate the washing tank 1 from the driving side base 7 to store them separately in smaller spaces.

Accordingly, a large place is not needed for storing the washing apparatus. Thus, it is easier to handle the washing apparatus. In addition, the operations to be done before and after washing may be simplified.

Also, in the present embodiment, a motor is used, for example, as the rotary drive unit 8. A drive power supply device is the whole of a device necessary for driving such as a capacitor for phase advance (not shown). As wash water, detergent and water are generally used, and also used are various detergents such as disinfectant solution, alcohol, softener, bleach and starch in accordance with the kinds of laundry. For example, a disinfectant solution is used when washing is done for disinfecting purpose at a food handling place, a hospital or the like. Also, a softener and starch are generally used for washing. Accordingly, wash water means general drugs and chemicals used for the purpose of washing. And, since rinsing is also a step of washing, water alone is sometimes used as wash water.

In the present embodiment, there is no particular limitations on the sizes of the washing tank 1 and the driving side base 7. Washing machines of various sizes can be used according to the purposes.

Particularly, in case the washing tank 1 is small, a small volume of laundry can be easily washed. Further, it is easy to carry the washing tank 1 and the driving side base 7 to the desired place. The washing tank 1 can be used as a bucket.

It is also possible to use a washing apparatus having a larger washing tank according to the purpose.

## Embodiment 2:

As shown in Fig. 4, driving speed reducer 14 is installed between rotary drive unit 8 in driving side base 7a and second transfer joint 10. The second transfer joint 10 is attached to the driving shaft 15 of the driving speed reducer 14. The rotating speed of the rotary drive unit 8 is reduced and transmitted to the second transfer joint 10. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. Generally, when the rotary drive unit 8 is configured with a motor, the rotating speed of the rotary drive unit 8 is determined by the power supply frequency and the number of poles. In case of a high rotating speed, troubles such as water spattering and insufficient rotational torque will be generated, and it becomes necessary to make the stirring blade 2 smaller in size or flat in shape. In that case, however, it is sometimes unable to make the shape of the stirring blade 2 suited for washing or to obtain an appropriate rotating speed.

The driving speed reducer 14 serves to reduce the rotating speed of the stirring blade 2 to a level suited for washing. Since the driving speed reducer 14 is disposed in the driving side base 7a, appropriate speeds of the rotary drive unit 8 can be reliably transmitted to the second transfer joint, and thereby, the intended washing effect can be obtained. Also, since the driving speed reducer 14 is installed in the driving side base 7a, it is possible to transmit appropriate rotating speeds without increasing

the load of the washing tank 1.

As the driving speed reducer 14, a gear system, a planetary gear system or reduction belt system is employed, which may bring about same effects.

### Embodiment 3:

As shown in Fig. 5, control means 16 is disposed in driving side base 7b, which controls the rotation transferred by first transfer joint 6 and second transfer joint 10 to stirring blade 2, thereby controlling the rotation of rotary drive unit 8. The control means 16 is formed of a time adjusting device. With respect to the other configuration, there is no difference from the embodiment 2, and same reference numeral are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. The time adjusting device comprising the control means 16 is able to control the preset washing time for the stirring blade 2 such as repetition of ON/OFF operation or specified time or rotating speed. Thus, it is possible to realize the appropriate operation of the stirring blade 2 for washing (including the time sharing of ON/OFF operation) and further to set the time appropriate for washing. Also, since the control means 16 is disposed in the driving side base 7b, it is possible to improve the using convenience while maintaining the operation ability of the washing apparatus.

As a control means for controlling the rotation, a mechanical timer, electric timer, or microcomputer and relay are used, which may bring



about same effects.

#### Embodiment 4:

As shown in Fig. 6, a grip portion 17 is disposed close to the upper opening of the washing tank 1. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. The washing tank 1 can be easily removed from the driving side base 7 by holding the grip portion 17. Also, it is easy to make the preparation for washing and to carry the laundry by using the grip portion 17.

#### Embodiment 5:

As shown in Fig. 7, there is provided, on the inner wall of washing tank 1a, at least one (two in the present embodiment) water level line 18 showing the level of the wash water poured into washing tank 1a. The water level line 18 is indicated by using a round offset formed along the inner periphery of the washing tank 1a. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numeral are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. The water level line 18 indicates the level of water poured into

the detachable washing tank 1. The quantity of water suited for washing can be easily set according to the volume of the laundry, and the water level can be easily adjusted. Further, with the washing tank 1a mounted on the driving side base 7, if the washing tank 1a is inclined, it can be visually checked by observing the water level line 18, and thereby, it is possible for example to prevent the washing tank 1a from falling down.

In the present embodiment, the water level line 18 is indicated by a round offset formed along the inner periphery of the washing tank 1a, but it is not limited to this configuration. Same effects can be obtained by using an intermittent line or, instead of using an offset, by using color print, seal or the like.

#### Embodiment 6:

As shown in Fig. 8, washing tank 1b includes at least one wash assisting convex 19 arranged nearly vertically at around the bottom of the inner wall surface thereof. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same elements, omitting the description thereof.

The operations in this configuration will be described in the following. The laundry (not shown) thrown into the washing tank 1b is agitated and washed in the wash water (not shown) by the stirring blade 2 during the washing process. In this case, when washing very dirty clothes, the laundry may be rubbed against the wash assisting convex 19, thereby obtaining strong washing forces and the intended washing effect.

In the present embodiment, the wash assisting convex 19 is a rib-

like shaped convex but it is not limited to this configuration, and it is possible to use any other shape that may enhance the washing effect by rubbing the laundry against the convex. In any case, there should be a convex on the inner wall of the washing tank 1b independent of the driving side base (not shown), thereby improving the washing effect.

#### Embodiment 7:

As shown in Fig. 9, a cover 20 is disposed at the upper opening of the washing tank 1, which can be freely opened and closed. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. Since the cover 20 which can be freely opened and closed is attached to the upper opening portion of the washing tank 1, it is possible to prevent spattering of the water or intrusion of foreign matter when making the preparation for washing and applying the laundry or wash water into the washing tank 1.

In the present embodiment, the cover 20 is detachable, but it is not limited to this configuration, and it is also possible to adopt a configuration in which the cover is not detachable, and the effects then obtained will be same as in use of a detachable cover.

#### Embodiment 8:

As shown in Fig. 10 (a), a cover 20a has a rib-like lock mechanism

21 to keep the cover 20a closed. There is provided a lock retainer 22 near the upper opening portion of the washing tank 1c. With respect to the other configuration, there is no difference from the embodiment 7, and same reference numerals are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. When the upper opening of the washing tank 1c is closed by the cover 20a, and the cover 20a is turned in the direction of the arrow, as shown in Fig. 10 (b), the lock mechanism 21 of the cover 20a is retained by the lock retainer 22. In this way, it is possible to limit the opening and closing of the cover 20a.

Thus, the cover 20a is prevented from being disengaged while the washing tank 1c containing the laundry or wash water is carried, or there is no fear of such accident that the cover is opened by a child causing him or her to get hurt or the like.

In the present embodiment, the cover locking mechanism functions when turned, but it is not limited to this configuration, and it is possible to use a configuration in which a lock mechanism is arranged between the washing tank 1c and the cover 20a. For example, a claw, cam, buckle or the like can be used as the lock mechanism, and in this case, same effects can be obtained.

#### Embodiment 9:

As shown in Fig. 11 (a), a cover 20b is disposed at the upper opening portion of the washing tank 1, which can be freely opened and

closed. There are provided holes 23 to drain the wash water in the washing tank 1 when the washing tank 1 is inclined or shifted upside down. The holes 23 are a plurality of oval holes. With respect to the other configuration, there is no difference from the embodiment 8, and same reference numerals are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. As shown in Fig. 11 (b), to drain the wash water after washing, the upper opening of the washing tank 1 is closed by cover 20b, then the wash water is discharged from the holes 23 formed in the cover 20b. In that case, the holes 23 are enough to drain only the wash water but not so large as to allow the laundry to go through. Thus, the laundry can be easily separated from the wash water. For example, the operation to reuse the wash water or to discharge the wash water into a toilet bowl can be easily performed.

In the present embodiment, the holes 23 are a plurality of oval holes, but it is not limited to this configuration, and the shape and number of holes can be freely determined.

#### Embodiment 10:

As shown in Fig. 12, a cover 20c is disposed at the upper opening portion of the washing tank 1, which may be freely opened and closed. Holes 23a are formed in cover 20c. The wash water in the washing tank 1 is drained from the holes 23a when the washing tank 1 is inclined or shifted upside down. There is provided a throat rib 24 at the contour of

the hole 23a. With respect to the other configuration, there is no difference from the embodiment 9, and same reference numerals are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. When the wash water is drained by inclining the washing tank 1, and after draining, dripping of the water is prevented by the throat rib 24. The wash water is prevented from dripping out of the holes 23a. The outer wall of the washing tank 1 is prevented from being stained with the wash water. The wash water does not drip on the floor.

#### Embodiment 11:

As shown in Fig. 13, a cover 20d is disposed at the upper opening portion of the washing tank 1, which may be freely opened and closed. Holes 23b are formed in cover 20d. The wash water in the washing tank 1 is drained from the holes 23b when the washing tank 1 is inclined or shifted upside down. There is provided a convex 25 at the washing tank 1 side of the hole 23b. The convex 25 serves to prevent the hole 23b from being clogged by the clothes. The convex 25 has a rib-like shape partly broken away. With respect to the other configuration, there is no difference from the embodiment 10, and same reference numerals are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. The wash water with laundry 13 immersed therein is drained by inclining the washing tank 1. In case of no convex 25, the laundry 13 will stick to the holes 23b, causing the holes 23b to be clogged by the

laundry 13 and making it impossible to drain the wash water.

By disposing the convex 25 at the washing tank 1 side of the hole 23b, when draining by inclining the washing tank 1, it is possible to prevent the hole 23b from being clogged by the laundry 13 as the laundry is caught by the convex 25. Thus, the wash water flows out through the notch of the convex 25, enabling easy draining of the wash water.

In the present embodiment, the convex 25 has a rib-like shape partly broken way, but it is not limited to this configuration, and it is possible to use a rib, pin-like projection, groove or the like as the convex 25. It is also possible to use a shape by which failure of draining due to complete covering of the hole 23b with the laundry 13 can be prevented. Same effects can be obtained by using this configuration.

#### Embodiment 12:

As shown in Fig. 14, there are provided a lower drain hole 26 and lower drain hose 27 for washing tank 1d. The lower drain hole 26 discharges the wash water nearly downward. The lower drain hose 27 is connected to the lower drain hole 26. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. As shown in Fig. 15, by shifting down the lower drain hose 27, the wash water 12 in the washing tank 1d can be easily drained into a drain ditch 28 or the like, thereby improving the operation ability.

Embodiment 13:

As shown in Fig. 16 (a), a lower drain hole 26 is disposed nearly at the bottom of washing tank 1d, and a lower drain hose 27a is connected to the lower drain hole 26. A lower cut-off valve 29 is disposed in the drain passage of the lower drain hose 27a. The wash water is drained through the lower drain hole 26 and lower drain hose 27a. With respect to the other configuration, there is no difference from the embodiment 12, and same reference numerals are used for same component elements, omitting the description thereof.

The operations in this configuration will be described in the following. As shown in Fig. 16 (b), the lower drain hose 27a is shifted down and the lower cut-off valve 29 is opened to drain the wash water 12 out of the washing tank 1d.

Thus, in case the lower drain hose 27a is accidentally brought down during washing, or when carrying the washing tank 1, the wash water is prevented from flowing out through the lower drain hose 27a.

In the present embodiment, the lower cut-off valve 29 which serves to open and close the valve is disposed at the end of the lower drain hose 27a, but it is not limited to this configuration. It is possible to dispose the cut-off valve 29 between the lower drain hole 26 in the drain passage and the lower drain hose 27a. This configuration also brings about same effects.

Also, a cut-off valve of open/close type or using a ball can be used as the lower cut-off valve 29, and this configuration also brings about same



effects.

#### Embodiment 14:

As shown in Fig. 17 (a), feed water passage 30 is disposed nearly at the upper portion of washing tank 1e. The feed water passage 30 serves to feed the water into the washing tank 1e. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

In this configuration, the feed water passage 30 is connected to the faucet 31 to feed city water into the washing tank 1e. In this case, even when the faucet 31 is located lower than the height of the washing tank 1e, water can be smoothly supplied by connecting a water-supply hose or the like to the feed water passage 30.

Or, the feed water passage 30 is, as shown in Fig. 17 (b), disposed in cover 20e. By this configuration, water can be smoothly supplied the same as described above by connecting a water-supply hose to the feed water passage 30. In this case, it is not required to dispose the feed water passage 30 nearly at the upper portion of the washing tank 1e.

#### Embodiment 15:

As shown in Fig. 18, upper drain hole 32 for draining is disposed at the upper portion of washing tank 1f. Upper drain hose 33 is connected to the upper drain hose 32. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are

used for same component elements, omitting the description thereof.

In this configuration, as shown in Fig. 19, when rinsing is performed by using washing tank 1f, the water can be drained from the washing tank 1f through the upper drain hole 32 and the upper drain hose 33. Accordingly, it is possible to perform so-called overflow rinsing while feeding water into the washing tank 1f with water filled up to a certain level. In this way, the laundry can be smoothly rinsed without repeating water feeding and draining many times.

#### Embodiment 16:

As shown in Fig. 20, upper drain hose 33a is connected to upper drain hole 32 disposed at the upper portion of washing tank 1f. Upper drain cut-off valve 34 for drain control is installed in the drain passage of the upper drain hose 33a. With respect to the other configuration, there is no difference from the embodiment 1.

In this configuration, as shown in Fig. 20 (a), rinsing while feeding water that is so-called overflow rinsing can be performed by opening the upper drain cut-off valve 34. Also, even when overflow rinsing is not performed, as shown in Fig. 20 (b), by closing the upper drain cut-off valve 34, in case the washing tank 1f containing water is carried or the level of wash water is high in washing, the wash water is prevented from flowing out of the machine and from dripping to stain the floor.

In the present embodiment, the upper drain cut-off valve 34 disposed at the end of the upper drain hose 33a is an open/close type valve, but it is not limited to this configuration. The upper drain cut-off valve 34

is installed between the upper drain hole 32 in the drain passage and the upper drain hose 33a. By this configuration, same effects as described above may be obtained.

#### Embodiment 17:

As shown in Fig. 21, guide 34 is disposed at the upper portion of driving side base 7c, and the guide 34 can be attached to the lower portion of washing tank 1. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

In this configuration, when the washing tank 1 is mounted on top of the driving side base 7c, the washing tank 1 is positioned by the guide 34. Accordingly, the mounting ability of the washing tank 1 can be enhanced. Placing the washing tank 1 on the driving side base 7c is just enough to smoothly make the connection between the first transfer joint 6 and the second transfer joint 10.

#### Embodiment 18:

As shown in Fig. 22, tank support portion 36 which connects with washing tank 1g is disposed at the upper part of the driving side base 7d. Tank fixing member 37 which secures the washing tank 1g on the driving side base 7d is disposed nearly at the bottom of the washing tank 1g. A tank locking mechanism is formed by the tank fixing member 37 and the tank support portion 36. As shown in Fig. 23, the tank fixing member 37 is convex, and the tank support portion 36 is concave. The washing tank

1g can be locked as the tank fixing member 37 engages the tank support portion 36 of the driving side base 7d when the tank is turned. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numeral are used for same component elements, omitting the description thereof.

In this configuration, the washing tank 1g and the driving side base 7d are detachable, and there is provided a tank locking mechanism which can secure the washing tank 1g when installed while maintaining a state of being detachable. Accordingly, the washing tank 1g is prevented from falling down by mistake during washing or from being disengaged due to vibration or the like from the driving side base 7d.

In the present configuration, the tank fixing member 37 is convex and the tank support portion 36 is concave, and the tank can be locked by turning the washing tank 1g, but it is not limited to this configuration. It can also be configured that the washing tank 1g side is concave while the driving side base 7d is convex. In that case, same effects as described above can be obtained. Also, the locking mechanism is based on a rotary system, but it is not limited to this configuration, and a locking mechanism by cylinder can be used, which brings about same effects as described above.

#### Embodiment 19:

As shown in Fig. 24, detecting portion 38 is disposed close to the connection nearly at the bottom of washing tank 1h, and connection detector 39 is disposed at the driving side base 7e side. The connection

detector 39 serves to detect the connection between the driving side base 7e and the washing tank 1h. The output from the connection detector 39 is inputted to control means 40, thereby controlling the rotary drive unit 8. With respect to the other configuration, there is no difference from the embodiment 18, and same reference numerals are used for same component elements, omitting the description thereof.

In this configuration, by the detecting portion 38 and the connection detector 39, when the washing tank 1h is separate from the driving side base 7e, the control means 40 serves to control so that the rotary drive unit 8 does not rotate or rotates at a low speed according to the output from the connection detector 39.

Thus, when the washing tank 1h is not mounted on the driving side base 7e, the second transfer joint 10 of the driving side base 7e does not rotate individually, thereby preventing the user's fingers or hands touching the rotating parts from getting injured. Also, when washing is started with the washing tank 1h not completely placed on the driving side base 7e, removal of the washing tank 1h, for example, can be prevented.

As the detecting portion 38, a magnet, reflection plate, detent or convex can be used. And as the connection detector 39, a lead switch, optical sensor or mechanical switch can be used. In the configuration, the rotation is controlled so that either the rotary drive unit 8 is rotated or the rotation is transmitted to the second transfer joint 10 only when the washing tank 1h is mounted on the driving side base 7e. In this way, same effects as described above can be obtained.

Embodiment 20:

As shown in Fig. 25, protective convex 41 is disposed on top of the driving side base 7f so as to cover the periphery of the second transfer joint 10. With respect to the other configuration, there is no difference from the embodiment 1.

In this configuration, as shown in Fig. 26, since the protective convex 41 is disposed so as to cover the second transfer joint 10, there is no fear that an object is placed on the second transfer joint 10 when the washing tank 1 is not mounted thereon. Hitting the washing tank 1 by mistake against the second transfer joint 10 can be prevented. In case the driving side base 7f is dropped during carrying, the second transfer joint 10 is prevented from being deformed or damaged.

Also, when no such connection detector 39 as in the embodiment 19 is disposed, there is no fear that the operator inserts his or her fingers into a space around the second transfer joint 10. Or, even when the user touches his or her hand onto the second transfer joint 10, the user is prevented from getting hurt.

Embodiment 21:

As shown in Fig. 27, drain passage 42 is disposed close to the second transfer joint 10 on top of the driving side base 7g. The drain passage 42 serves to drain the water stayed therein. With respect to the other configuration, there is no difference from the embodiment 20.

In this configuration, if some water is spilled when attaching or detaching the washing tank 1, or some water is spilled by mistake on top of

the second transfer joint 10, the water can be drained through the drain passage 42. In this way, the water is prevented from staying at the bottom of the second transfer joint 10. Also, intrusion of the water into the machine, causing damage thereto, can be prevented. The user is prevented from getting an electric shock.

#### Embodiment 22:

As shown in Fig. 28, internal drain passage 43 is disposed inside the driving side base 7h, and there is provided a drain hole 45 with a drain valve 44 in the washing tank 1i. The drain valve 44 is attached to a drain valve shaft 47 via an elastic element 46. The drain valve 44 opens when the drain valve shaft 47 is pushed up.

Also, release pin 48 is disposed in the internal drain passage 43. Only with the washing tank 1i placed on the driving side base 7h, the release pin 48 pushes the drain valve shaft 47. Further, drain port lid 47 is disposed in the internal drain passage 43, and the drain port lid 47 is able to close the internal drain passage 43. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

In this configuration, as shown in Fig. 29, when the washing tank 1i is placed on the driving side base 7h, the drain valve shaft 47 is pushed by the release pin 48, the drain valve 44 is then opened, and the washing tank 1i and the internal drain passage 43 communicated with each other via the drain hole 45.

Thus, there is no need for the washing tank 1i to have a drain port or drain hose, and washing can be done with the driving side base 7h fixed in a place where the water can be drained. Further, when carrying the washing tank 1i containing water, there is no fear of water leakage. Also, since the internal drain passage 43 is disposed inside the driving side base 7h, the washing tank 1i detachably disposed can be reduced in weight and also in carrying load. As a result, the operation ability will be improved.

#### Embodiment 23:

As shown in Fig. 30, internal drain passage 43a is disposed inside the driving side base 7i. There is provided a drain control valve 50 in the internal drain passage 43a. The drain control valve 50 is controlled by drain controller 51. With respect to the other configuration, there is no difference from the embodiment 22, and same reference numerals are used for same component elements, omitting the description thereof.

In this configuration, after washing in the washing tank 1i, the drain control valve 50 is opened by the drain controller 51, and thereby, the wash water in the washing tank 1i can be drained through the internal drain passage 43a.

Accordingly, it is not necessary to perform operations for draining such as inclining the washing tank 1i, bringing down the drain hose or manually opening the valve. The wash water can be automatically drained by the drain controller 51. Further, because of the driving side base 7i having such configuration, the washing tank 1i detachably disposed thereon is reduced in weight and also in carrying load. As a



result, the operation ability will be improved.

#### Embodiment 24:

As shown in Fig. 31, internal drain passage 43b is disposed inside the driving side base 7j. There is provided a drain control valve 50a in the internal drain passage 43b. The drain control valve 50a is controlled by drain controller 51a. A water level detector 52 is installed inside the driving side base 7j. The water level detector 52 serves to detect the level of wash water in the washing tank 1i. With respect to the other configuration, there is no difference from the embodiment 23, and same reference numerals are used for same component elements, omitting the description thereof.

In this configuration, after washing in the washing tank 1i, the drain control valve 50a is opened by the drain controller 51a, and thereby, the wash water in the washing tank 1i is drained through the driving side base 43b. When the drain water is completely discharged, it is detected by the water level detector 52 to stop draining. Accordingly, it is not necessary to perform operations such as inclining the washing tank 1i, bringing down the drain hose or manually opening the valve.

Also, in case an excessive volume of the wash water is detected by the water level detector 52 during operation, the drain control valve 50a is opened by the drain controller 51a to automatically drain the wash water. Also, it is possible to adjust the washing effect by opening the drain control valve 50a during the washing operation. In this way, the volume of wash water can be easily adjusted (reduced) automatically. Further, because of

the driving side base 7j having such configuration, the washing tank 1i can be reduced in weight and also in carrying load. As a result, the operation ability may be improved.

In the present embodiment, when the wash water in the washing tank 1i is completely discharged, it is detected by the water level detector 52 to stop draining. When the wash water is excessive, it is detected to automatically stop the wash water. However, it is not limited to this configuration, and it is also possible to adopt a configuration such that the wash water is automatically drained by setting the draining time on a drain time adjusting device. By this configuration, same effects as described above can be obtained.

#### Embodiment 25:

As shown in Fig. 32, water supply means 54 such as internal feed water passage 53 and water feed valve is disposed inside the driving side base 7k. A washing tank feed water passage 56 having a feed water passage valve 55 is installed in the washing tank 1j. With the washing tank 1j placed on the driving side base 7k, the feed water passage valve 55 is opened, then the washing tank 1j and the internal feed water passage 53 are communicated with each other via the feed water passage valve 55.

A water level detector 57 is disposed in the internal feed water passage 53, and the level of the wash water in the washing tank 1j is detected by the water level detector 57. The predetermined water supply time is set on the water supply time adjusting device 58. Since there is provided at least either one of the water level detector 57 or the water

supply time adjusting device 58, the water is automatically supplied into the washing tank 1j. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

In the above configuration, when washing is done in the washing tank 1j, the water supply means 54 is opened and the water is supplied from the faucet 31 into the washing tank 1j through the internal feed water passage 53, water supply means 54, washing tank feed water passage 56, and feed water passage valve 55. And, the water feeding operation is discontinued on detection of the predetermined water level by the water level detector 57 or on lapse of the predetermined water supply time set on the water supply time adjusting device 58.

Also, in case the wash water is not enough during operation, it is detected by water level detector 57, then (i) water is automatically supplied, (ii) water supply means 54 is operated to automatically supply the water for a predetermined time in washing, and (iii) the water supply means is opened to adjust the washing effect during the washing operation. Thus, the wash water can be easily adjusted (increased) automatically. Further, because of the driving side base 7k having such configuration, the washing tank 1j detachably disposed thereon can be reduced in weight and also in carrying load. As a result, the operation ability will be improved.

#### Embodiment 26:

As shown in Fig. 33 (a), washing tank 1k is detachably disposed on driving side base 7m. The driving side base 7m can be housed in the

washing tank 1k. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

A small sized washing machine of a conventional type is convenient in washing, but the driving side base is structurally one-piece with the washing tank. Accordingly, even when the washing tank is empty, the size of the washing machine remains unchanged requiring a large space for its storage, often causing a problem in keeping the washing apparatus.

In the present embodiment, as shown in Fig. 33 (b), the driving side base 7m can be housed into the washing tank 1k, and therefore, the size of the washing apparatus when not in use is reduced to the size of the washing tank 1k only. Accordingly, the advantages in storing the washing apparatus may be greatly improved.

In the present embodiment, the driving side base 7m is stored upright in the washing tank, but it is not limited to this configuration. It is also possible to use a configuration such that the driving side base 7m is turned over or falling down sidelong in the washing tank. This configuration will bring about excellent advantages the same as described above in storing the driving side base in the washing tank 1k.

Also, Fig. 33 shows a cover 20, but it is not limited to this configuration, and a configuration without using the cover 20 can also be used. By this configuration, excellent advantages in storing the apparatus can also be obtained.

Embodiment 27:

As shown in Fig. 34, driving side base 7n can be stored in washing tank 1k. Also, storing handle 59 is attached to the driving side base 7n. With respect to the other configuration, there is no difference from the embodiment 26.

In the above configuration, when taking the driving side base 7n out of the washing tank 1k or storing same into the washing tank 1k, the user is able to grip the storing handle 59 to carry out the job smoothly. As a result, the advantages in storing the apparatus is improved.

In the present embodiment, the driving side base 7n is stored upright in the washing tank, and the storing handle 59 is located on top of the driving side base 7n, but it is not limited to this configuration. It is possible to store the driving side base 7n in any positions. In that case, the storing handle 59 is disposed in an optimum position that is most convenient for storing the driving side base. In this way, the storing job can be smoothly performed.

Embodiment 28:

As shown in Fig. 35, driving side base 7m can be stored in washing tank 1m. Holding projection 60 to hold the driving side base 7m is disposed on the inner wall of the washing tank 1m. With respect to the other configuration, there is no difference from the embodiment 26.

In the above configuration, when the driving side base 7m is stored into the washing tank 1m, the driving side base 7m is held by the holding projection 60 in the washing tank 1m. In this state, in case the driving

side base 7m is kept being stored in the washing tank 1m for a long period of time or the washing apparatus is carried by a truck or the like, the driving side base is prevented from getting deep into the washing tank 1m. As a result, the driving side base 7m can be smoothly removed from the washing tank at any time.

Using a configuration such that the holding projection 60 disposed on the inner wall of the washing tank 1m also serves as a wash assisting convex, the washboard effect can be enhanced since the clothes are rubbed against the holding projection 60 as the stirring blade is rotated during the washing process. Thus, it is possible to obtain stronger washing forces and also to simplify the configuration.

#### Embodiment 29:

As shown in Fig. 36, battery 61 is disposed in driving side base 7p. The battery supplies power to the rotary drive unit 8. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

In the above configuration, since power is supplied to the rotary drive unit 8 by the battery 61, washing can be performed anywhere even when no power supply is available in the washing place or in case of using the washing apparatus in the open air.

#### Embodiment 30:

As shown in Fig. 37, driving side base 7q can be stored under the

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floor 62, and the washing tank 1 is detachably mounted on the driving side base 7q. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used for same component elements, omitting the description thereof.

In the above configuration, when washing dirty laundry such as diapers, the driving side base 7q is stored under the toilet floor 62, and the washing tank 1 is detachably mounted on the driving side base 7q. In this way, after throwing the baby's discharges into the toilet bowl, the dirty laundry can be easily washed on the spot without moving the dirty laundry from place to place.

Also, as shown in Fig. 38, by storing the driving side base 7q in the drawer of closet 63 or in a kitchen sink (not shown), the dirty laundry, if any, can be easily washed on the spot by mounting the washing tank 1 on the driving side base 7q. In this way, only getting the washing tank 1 ready, washing can be done easily on the spot. As a result, the washing apparatus is improved in using convenience.

#### Embodiment 31:

As shown in Fig. 39, speed change means 64 and time change means 65 are disposed on driving side base 7r. The speed change means 64 is used to change the rotating speed of the rotary drive unit 8. The time change means 65 is used to change the ON/OFF time of the rotary drive unit 8. The washing tank 1 is detachably mounted on the driving side base 7r. With respect to the other configuration, there is no difference from the embodiment 1, and same reference numerals are used

for same component elements, omitting the description thereof.

In the above configuration, for example, a plurality of rotating speeds can be changed, and a strong stream of water is created with the drive unit rotated at a high speed, and as the rotating speed is lowered, a medium stream and a weak stream are generated. Thus, high and low levels of the rotating speed are indicated. The rotating speeds can be changed over. Also, the rotary drive unit 8 can be intermittently operated. There are provided a plurality of OFF time and ON time. When the ON time is long, it is used for washing thick and strong clothes. When the OFF time is long, it is used for washing delicate clothes. In this way, washing can be performed in various ways.

Also, by installing the speed change means 64 and the time change means 65 in the driving side base 7r, it is possible to make the washing tank 1 detachably mounted less in weight and also in carrying load, thereby improving the operation ability.

#### Embodiment 32:

A process chart of a method of washing the laundry in one embodiment of the present invention is shown in Fig. 40. Also, the configuration is shown in Fig. 1.

In Fig. 1 and Fig. 40, the method of washing the laundry comprises the steps of:

- (a) preparing a driving side base 7 having a rotary drive unit 8;
- (b) preparing a washing tank 1 having a stirring blade 2;
- (c) disposing the washing tank on top of the driving side base,



where the stirring blade and the rotary drive unit are connected with each other when the washing tank is disposed on top of the driving side base;

(d) putting the laundry into the washing tank;

(e) putting the water into the washing tank;

(f) driving the rotary drive unit with the washing tank containing the laundry and the water disposed on the driving side base,

thereby the stirring blade is driven to stir the water and the laundry; and

(g) separating the washing tank being disposed on top of the driving side base from the driving side base.

Preferably, the driving side base 7 further comprises a second transfer joint 10 disposed on top of the driving side base;

the washing tank 1 includes a shaft 5 piercing through the bottom of the washing tank, and a first transfer joint 6 disposed on the shaft, outside the bottom of the washing tank; and

in the step (c), when the washing tank is disposed on top of the driving side base, the first transfer joint 6 and the second transfer joint 10 come to engage each other, and the stirring blade and the rotary drive unit are connected with each other via the first transfer joint, the shaft and the second transfer joint.

In the present embodiment, it is possible to put the laundry or wash water into the washing tank before mounting the washing tank on the driving side base. And it is also possible to put the laundry or wash water into the washing tank after mounting the washing tank on the

driving side base.

Also, in the embodiment 32, it is possible to use the same configuration as mentioned in the embodiments 1 through 31.

By such methods of washing, same washing effects as those in the embodiments 1 through 31 can be obtained.

As described above, due to the configuration of the present invention, the washing apparatus can be easily handled and is improved in the before- and after-washing operation ability.

For example, the laundry in the washing tank can be carried without using any separate container such as a bucket, and it is not necessary to transfer the laundry from a bucket to the washing tank. In addition, washing can be simply performed. For example, various kinds of laundry can be separately washed according to each kind of the laundry. It is easy to separately wash various kinds of laundry properly sorted such as unsanitary wash, slightly dirty wash, and very dirty wash. Further, the laundry that is liable to deform or fade in color can be separately washed. Also, a small volume of laundry can be washed by using this washing apparatus, and therefore, the user's hands are prevented from getting rough with washing. Further, when storing the washing apparatus, it is possible to separate the washing tank from the driving side base to store them separately in smaller spaces. Accordingly, a large place is not needed for storing the washing apparatus.